N-C-E-P-H

Aboriginal Fertility:
Trends and Prospects

by

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GLOSSARY

Aboriginal: *In this paper the term 'Aboriginal', unless qualified, includes Torres Strait Islander people. In tables based on 1986 or 1981 Census data, 'Aboriginal' refers to any person who answered 'Aboriginal' or 'Torres Strait Islander' in response to the census question on Aboriginal origin.*

Age-specific birth rate, (*alternatively* **age-specific fertility rate**): *Number of live births to each thousand women of the specified age or age group, per year.*

Children ever born(e): *Number of children, excluding still-born children, ever borne by a category of women 15 years of age and over, as stated in the 1986 or 1981 Census.*

Childlessness index: *Women aged 15 to 34 with no children, expressed as an indirectly age-standardized index compared with all childless Aboriginal women aged 15 to 34. The standard value of the index is 100.*

Fertility: *In demographic usage, the term fertility refers to reproductive performance, not the capacity to bear children, which is called fecundity. The term infecundity, which is also used in this paper, refers to impairment of the physical capacity to bear children.*

Index of maternal fertility: *Average number of children of Aboriginal mothers aged 15 to 34, expressed as an indirectly age-standardized index compared with the average for all Aboriginal women aged 15 to 34. The standard value of the index is 100.*

Infant death: *Death below one year of age of a child that was born alive.*

Infant mortality rate: *Number of infant deaths per thousand live births. The infant mortality rate is usually calculated, not strictly correctly, using the number of infant deaths and the number of live births in a given period; more correctly, the infant deaths included in the numerator should exclude infants born before the given period and include those who, though born in the given period, died after its end.*

Infecundity: *See* **fertility.**

Section of State or Territory: *The term 'major urban' refers to contiguous urban centres with populations of 100,000 or more - namely Adelaide, Brisbane, Canberra-Queanbeyan, the Central Coast of New South Wales, Geelong, the Gold Coast in Queensland and New South Wales, Hobart, Melbourne, Newcastle, Perth, Sydney and Wollongong. The term 'other urban' includes all urban centres with populations of 1,000 to 99,999, and known holiday resorts of smaller population if they contain 250 or more dwellings, of which at least 100 are occupied on Census night. In this paper, the term 'rural' includes persons enumerated in all other parts of Australia (including the category 'off-shore and migratory' - persons who were enumerated on off-shore drilling rigs, drilling platforms and the like, aboard ships in Australian waters, or on overnight journeys by train or bus).*

Total fertility rate: *The number of live births that a woman would have if she experienced each of the age-specific birth rates between exact ages 15 and 50.*

Introduction

The purpose of the paper is firstly to review the evidence about levels and trends of Aboriginal birth rates, and attempt an assessment of future directions, and secondly to analyse some of the factors differentiating the fertility of groups of Aboriginal women. In particular, the role of education of young women in determining recent changes in Aboriginal fertility levels will be highlighted.

Official estimates of Aboriginal fertility levels have been limited to estimates of crude birth rates, and for some States and Territories age-specific birth rates of varying degrees of accuracy.[1] While data from the official birth registration system is still patchy, there are now two census-based sets of estimates of Australian Aboriginal fertility rates for recent years.

One set, for each five-year period from 1956 to 1981 (Gray, 1983, 1984), was based on comparisons of reported numbers of children ever born to cohorts of Aboriginal women at the censuses of 1966, 1971, 1976 and 1981, and considerable estimation to resolve problems due to incomplete data and non-comparability of data. The estimates showed a rapid decline in Aboriginal fertility during the 1970s, from an estimated total fertility rate of 5.9 in 1966-1971 to 4.1 in 1971-1976 and 3.3 in 1976-1981.

Recently, the Australian Bureau of Statistics (Jain, 1989) has published estimates based on a different method of estimation for the period 1971-1986, using a single source, the 1986 Census of Population and Housing. The own-children method of estimation (Cho *et al.*, 1986) was used to produce two slightly different series of estimates, the first giving total fertility rates of 4.0 for 1971-1976, 3.3 for 1976-1981 and 3.0 for 1981-1986, and the second series giving estimates of 4.0, 3.1 and 2.8. It is very obvious that the estimates obtained by Jain for the two five-year periods from 1971 to 1981 are very close to those which I had previously obtained. Moreover, Jain cites a previously unpublished estimate of mine of 3.0 for the 1981-1986 period,[2] again showing agreement between the two methods of estimation.

The fact that two very different methods of estimation produce results which are very close to each other, at least in terms of overall level, is reassuring, and it will serve the useful purpose of inducing more confidence in users of either set of these estimates. For there can be no doubt that each method of estimation has had to face serious problems of data availability and quality. These issues will be discussed in some detail in this working paper. On the other hand, checks

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1 During the last few years, since the work of a Task Force on Aboriginal Health Statistics comprising representatives of the Australian Bureau of Statistics, the Commonwealth Department of Health and the Commonwealth Department of Aboriginal Affairs, most States and Territories have been moving to identify Aboriginal births and deaths in official notification forms. It will still be some time before this develops into a reliable source of regular information on the basic demographic characteristics of the Aboriginal population.
2 This estimate has since been revised slightly, to 3.1. See Table 1.

and balances in the methods mean that the estimates are, in the end, not particularly sensitive to these data problems.

Estimates derived from census sources also agree quite closely with such data as are available from direct collections which exist in some States and Territories, namely New South Wales, Queensland, South Australia, Western Australia and the Northern Territory. In other cases, the indirect estimates reveal gross deficiencies in the direct estimates. Some of the directly-estimated data have recently been published by the Australian Institute of Health (1988), but most are still unpublished.

Data sources

In the 1986 Census of Population and Housing in Australia, all women aged 15 and over were asked how many children they had ever borne, and how many were still living. The same question was asked in the 1981 Census.

Before the 1981 Census, the question on children ever borne had been asked only of a restricted category of women, namely those who had ever been married, or before 1971 those who were currently married. While the 1976 Census question was not intended to refer to women who had never been married, the Australian Bureau of Statistics did in fact publish data referring to all women who answered the question, so that the published data from the censuses of 1966, 1971, 1976 and 1981 refer to progressively wider categories of women on each occasion.

Answers to the question on children ever borne provided conceptual coverage of all women aged 15 and over in both 1981 and 1986, so that comparison of distributions of numbers of children ever borne from these two censuses provides conceptually complete measures of fertility in the intercensal period. For example, the average number of children ever borne by Aboriginal women aged 20 to 24, from the 1986 data, less the average number of children ever borne by Aboriginal women aged 15 to 19, from the 1981 data, equals the average number of children ever borne by Aboriginal women from this age cohort in the period 1981 to 1986. This principle of estimation was the one used to produce previous estimates of Aboriginal fertility (Gray, 1984), although slight adjustments had to be made to data from censuses before 1981 to allow comparability between sets of data with different conceptual coverage. Similar estimates for the 1981 to 1986 period are discussed in this paper.

Comparing information about the Australian Aboriginal population from any two censuses involves some problems. The most serious are caused by incompatible levels of enumeration of the Aboriginal population.

Problems caused by incompatible levels of census enumeration may not be quite as serious in dealing with statistics such as *average* numbers of children ever borne, as long as the Aboriginal people who are included in one census are *like* those included in another. It is possible that Aboriginal women who are enumerated in one census differ in their (life-time) child-bearing patterns from Aboriginal women in the same age cohort at the previous census, because they are not precisely the same women. However, we may expect to be able to overcome most such problems by restricting the comparisons to groups of women who are extremely likely to be similar. The most evident difference between Aboriginal women included in the 1986 Census and those enumerated in 1981 is in their geographical distribution. In 1986, much larger proportions were enumerated in some States, particularly in the south-east of Australia, than in 1981. Also, 26 per cent of Aboriginal women aged 15 and over in 1986 were located in major urban areas, compared with only 21 per cent in 1981.

It is desirable, in assessing fertility levels in the intercensal period using data from both the 1981 and 1986 Censuses, to control for these gross differences in geographical distribution. It is also not at all difficult to do so. All that is necessary is to undertake the analysis at the disaggregated geographical level.

It is also possible that the quality of response to the question on children ever borne is different in any two censuses. Analytical methods to deal with issues of response quality require some assumptions about the sources of non-response to questions on children ever borne. Experience in many countries (United Nations, 1983: 28-29) has confirmed that a major component of non-response is attributable to childless women who have no response recorded because respondents or enumerators have decided that the question does not apply to these women - for example young unmarried women. There is also under-reporting by older women, especially at ages above 40, where it may be found that the average number of children ever borne by women in an age cohort, as reported in one census, is lower than reported by the same age cohort in the previous census.

Both types of response problem affect Aboriginal data for 1986, 1981 and previous censuses. Analytical methods which have been used to overcome issues of quality of response are discussed in Appendix A.

The difference between the average numbers of children ever borne by an age cohort in two successive censuses is no simple standard demographic rate. For example, if the age cohort was aged 15-19 in 1981, and so 20-24 in 1986, then births represented by the difference between averages could have taken place at all ages between exact age 15 and exact age 25; but the difference does not include all such births, some of which belong to the cohorts aged 10-14 and 20-24 in 1981. Standard interpolation techniques of demographic analysis can be used to

transform a sequence of cohort-specific differences into a sequence of age-specific birth rates for standard five-year age groups.

Jain's (1989) estimates based on the own-children approach use an entirely different type of data from the 1986 Census of Population. The relationships within households are used to match children in households with their mothers if the mothers can be identified, and numbers of unmatched children and estimated numbers of children and mothers who have died are used to adjust the resultant estimates of fertility based on ages of children and ages of mothers. Interested readers may refer to the details given in Jain's paper (*op. cit.*: 2-8), which need not be repeated here. One of the major attractions of using the own-children method is that it is not affected by problems associated with non-comparability of data from different censuses.

An assessment of the worth of estimates produced by the own-children method happens to be extremely important, because of a decision made by the Australian Bureau of Statistics not to ask the traditional census questions about children ever borne and children surviving in the 1991 Census. This decision was taken through the process of 'consultation' with users, whereby the Australian Bureau of Statistics asks users of census data to criticize proposed changes to census questions, but does not explain how it makes decisions for its final recommendations to the Australian Statistics Advisory Council, and then to government. The *only* estimates of Aboriginal fertility that will be available from the 1991 Census will be those obtained from the own-children method.[3] Jain's paper (*op. cit.*: 14) explicitly recognizes the consequent importance of ensuring that the own-children estimates are evaluated carefully. Some attention will be directed in this paper at identifying the analytical issues.

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3 It should also be emphasized that there will be *no estimates at all* of Aboriginal child survival from the 1991 Census. This extraordinarily useful set of data was available from only one Census, the 1986 Census.

Age-specific and total fertility rates

The main results of analysis of distributions of children ever borne by Aboriginal women, as reported in the 1981 and 1986 Censuses, are shown in Table 1 in the form of estimated age-specific birth rates and total fertility rates for the intercensal period. The age-specific birth rate for an age group signifies the number of live births per thousand women in the age group per year. The total fertility rate is derived from the entire set of age-specific birth rates. It is the number of children that a woman would have if she experienced each of the age-specific birth rates between exact ages 15 and 50.

Table 1. Estimated age-specific birth rates[a]
and total fertility rates[b], Aboriginal women, 1981-1986,[c]
States & Territories and Sections of State,

| | \multicolumn{6}{c}{Age-specific birth rate} | TFR[b] |
	15-19	20-24	25-29	30-34	35-39	40-49	
State/Territory:							
NSW & ACT	109	175	171	92	36	3	2.9
VIC & TAS	87	148	180	116	75	23	3.3
QLD	108	194	200	102	42	12	3.3
SA	109	158	192	119	50	9	3.2
WA	156	215	148	48	31	4	3.0
NT	148	175	152	95	45	12	3.2
Section of State:							
Major urban	94	143	165	94	31	3	2.7
Other urban	124	196	171	84	43	6	3.2
Rural	141	197	165	88	32	8	3.2
Total	121	181	169	87	37	8	3.1

[a] Number of live births per thousand women in age group per year

[b] The total fertility rate (TFR) is the sum of the age-specific birth rates for single years of age, divided by one thousand, and represents the number of live births that a woman would have if she experienced each of the age-specific birth rates between the exact ages of 15 and 50

[c] The estimates shown in this table are based on numbers of children ever borne by Aboriginal women as reported in the 1981 Census and the 1986 Census. For details of estimation method see Appendix A

Overall, but not in all States and Territories, the highest age-specific birth rate for 1981-1986 is for Aboriginal women aged 20-24. The distribution about the modal value is, however, not the same in all States. In most, the age-specific birth rate for the 15-19 age group is lower than for the 25-29 age group, but in Western Australia the younger age group had the higher rate, and in the Northern Territory there was little difference between age-specific rates for the 15-19 and 25-29 age groups. Note that in major urban areas and in the eastern States, the estimated rate for 15-19-year-old women is not much more than half the rate for 25-29-year-old women, even less than half in Victoria-Tasmania. (Because of small Aboriginal population size, Tasmania has been grouped with Victoria, and the A.C.T. with New South Wales, but only in order to produce reasonable estimates in Table 1.)

These differences illustrate higher ages of child-bearing in the urban areas and particularly in the major urban areas than in the rural parts of Australia. While differences in the age distribution of child-bearing are marked, differences in level are less evident. The major urban areas had a somewhat lower total fertility rate than the other urban areas and rural areas, but the range of values of total fertility rates shown in the table, from 2.7 to 3.3, is spread quite narrowly around the overall estimate of 3.1 children.

The context of this apparent lack of geographical difference in the levels of Aboriginal total fertility rates is that differentials had been diminishing gradually over the previous twenty years or so. This convergence can be traced back to the 1960s, when Aboriginal birth rates in those States where they had been highest had already begun to fall, while rates were still increasing in some of other parts of Australia. During the early 1970s, fertility fell more rapidly in some States than others, but by the second half of the decade the differentials had narrowed right down, and have stayed slight since. The generally convergent downward trend is illustrated in Figure 1.

The total fertility rate of the whole Australian population for each year from 1981 to 1986 was 1.9 (Australian Bureau of Statistics, 1988: 7). Thus the overall level of Aboriginal fertility during this period was a little more than 50 per cent higher than in the total Australian population. While this represents a substantial difference, it should also be noted that the age distribution of Aboriginal fertility was indeed even more different than in the total Australian population. If we compare age-specific birth rates for the total population for the five calendar years 1981 to 1985 with rates for the Aboriginal population for the intercensal period June 1981 to June 1986, then the rate for 15-19-year-olds in the total population was 26 per thousand, compared with 121 per thousand in the Aboriginal population; among 20-24-year-olds, the rates were 101 (total population) and 181 (Aborigines); for age group 25-29, 145 and 169; for age group 30-34, 82 and 87; for age group 35-39, 25 and 37; and among 40-49-year-olds, 2 and 8. The comparison is also given in Figure 2. It can be seen that the higher total

fertility of Aboriginal women consists virtually entirely of very high fertility among young Aboriginal women, particularly teenagers. There are only slight differences in rates above exact age 25.

The figure also shows how much Aboriginal age-specific birth rates have fallen, across the age range, since the late 1960s, when the total fertility rate was 5.9. In proportionate terms, the fall in age-specific birth rates was *least* for age group 15-19 (where difference from the rest of the Australian population is now greatest). In the 15-19 age group, the 1981-1986 rate for Aboriginal women was still more than 80 per cent of the 1966-1971 rate. The fall in Aboriginal birth rates was progressively greater with increasing age, with the 1981-1986 rate for age group 40-49 being only about 20 per cent of the 1966-1971 rate.

FIGURE 1.
ABORIGINAL TOTAL FERTILITY RATES

FIGURE 2
AGE-SPECIFIC FERTILITY RATES
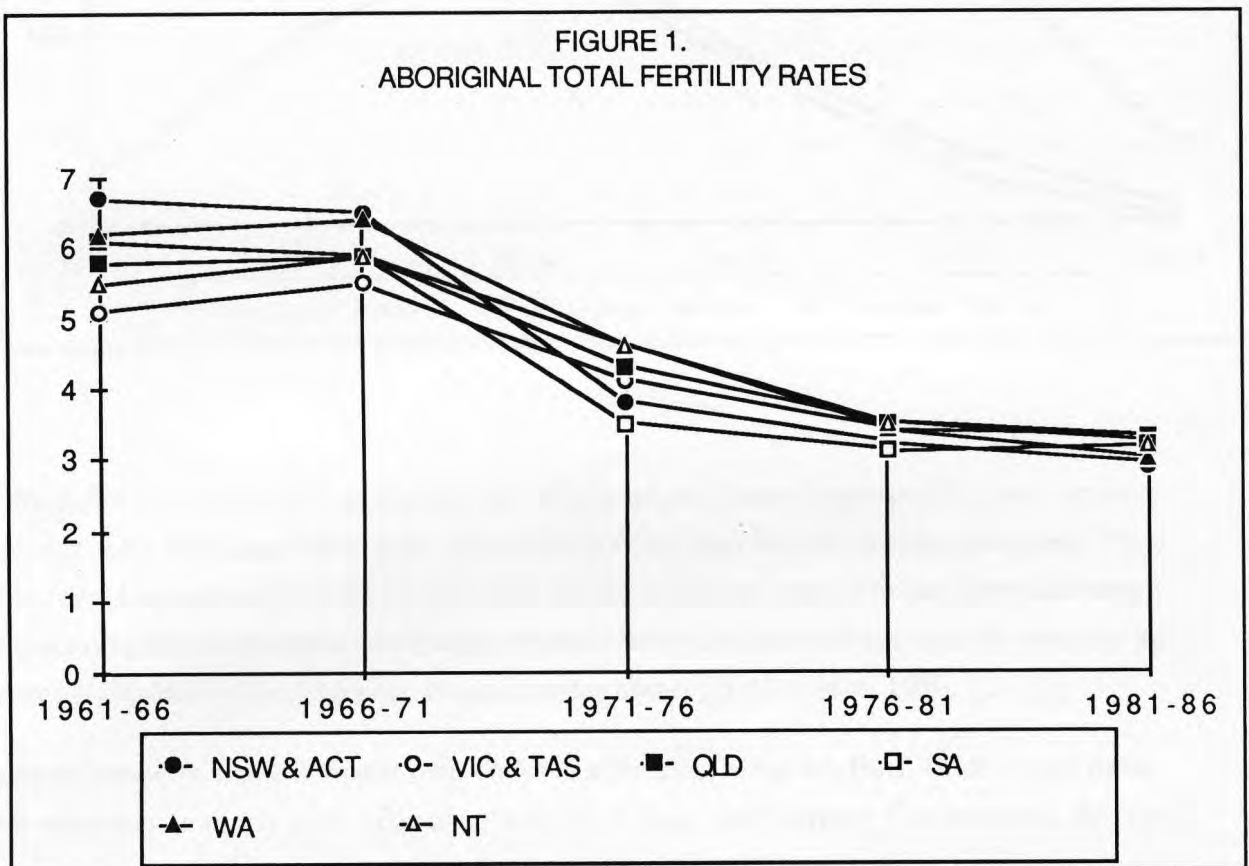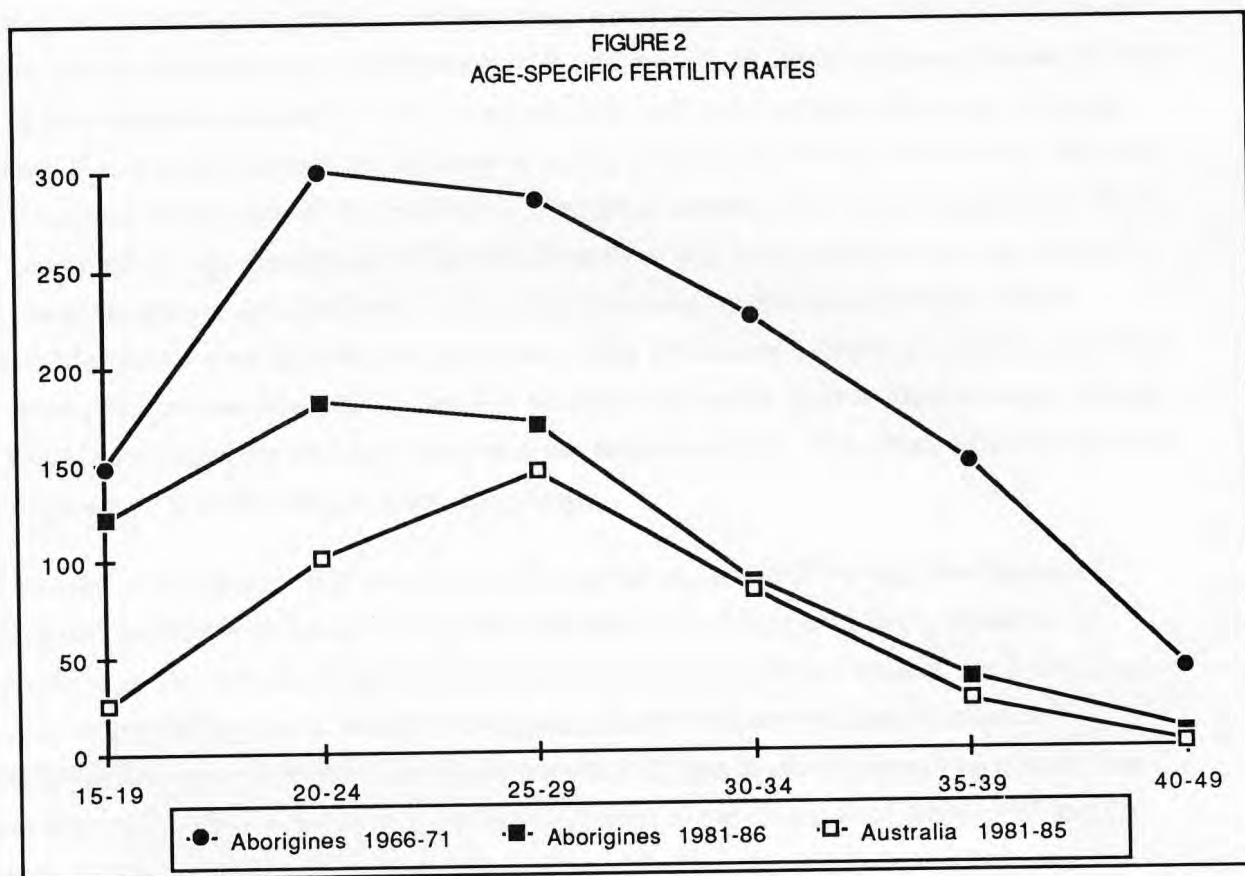
At this point it is worthwhile to discuss the validity of estimates of age-specific rates, because Jain's (*op. cit.*) estimates differ quite substantially from those that have been given here. Thus while Jain obtained similar total fertility rates for all periods as were obtained from intercensal comparisons, his distributions in all cases featured lower estimates of age-specific rates for age group 15-19, and higher estimates for age groups above 35. (See Jain, 1989: 11-13.)

Comparisons were made between own-children estimates, estimates from Table 1, and some other estimates available from official collections of State and Territory Governments. Because the own-children estimates are only available at national level, there could be no direct comparisons with State figures. However, comparison of data from Western Australia and the Northern Territory, from the intercensal analysis and State Government sources, showed a very close correspondence of levels and patterns. It therefore appears that it is the own-children estimates that are out of alinement.

There are very good reasons that the own-children method might misrepresent the pattern of age-specific birthrates while getting the total fertility rate approximately right. (It will be argued shortly that the *level* is also inaccurate for the very recent past.) The proportion of eligible Aboriginal children aged 0-14 in the 1986 Census that were 'non-own children' (that is, whose

mothers could not be identified), at about one quarter to one third (Jain, 1989: 6), was much higher than is usually found in application of the own-children method. Many of these children could have been the children of very young mothers, and were staying with aunts or grand-parents. If it is more common for children of *young* Aboriginal mothers to be living with other relations, and observation of the realities of Aboriginal communities would suggest that this is the case, then the age distribution of identified mothers will be distorted by having too few in the youngest age groups. Similarly, if there are substantial numbers of children whose supposed mothers were actually too old to have been the natural mothers of children more than 50 years younger (see Jain, *ibid.*), then it is probable that some other women between 35 and 50 years older than their 'children' were also not natural mothers. The effect would be to over-state age-specific birth rates for those age groups.

In this way, it can be seen that the *pattern* of apparent distortion of the age distribution of Aboriginal fertility from the own-children estimates is consistent with likely problems of application of the method. This does not establish that the results are invalid, but it does lend substance to a feeling that it would be dangerous to rely on own-children estimates of Aboriginal age-specific fertility rates from the 1991 Census in the absence of estimates from other sources. If there is not to be a gap in assessment of the direction of Aboriginal fertility change, it is imperative that methods for obtaining reliable estimates from the State and Territory Government collection systems be developed as rapidly as possible.

There is another problem with the own-children estimates, and that is to do with the pattern of change in fertility levels that they imply. Figure 3 shows the trend established by Jain's estimates.

An apparent acceleration in fertility decline in the 1980s is very noticeable, after the rapid decline of the early 1970s had ended in a plateau. The question is whether this acceleration in decline could possibly be genuine. It involves, for example, a fertility drop of more than 10 per cent in the most recent 18-month period shown in the figure. Extrapolation of such rapid change would have Aboriginal fertility below replacement level in no time at all, and establish a very different set of prospects for the future of the Aboriginal population.

Data problems are possibly at the root of this apparent down-turn as well. One of the most easily-established features of Aboriginal population structures as found at successive censuses is relatively greater under-enumeration of very young children than other sections of the population. The progressively greater deficiencies of children at ages two, one and zero years will, under the own-children method of estimation, be transformed directly and proportionately into progressively greater under-estimates of birth rates for recent periods.

While the size of the effect has not been established here, the point is that the own-children estimates carry with them very serious problems of interpretation. Questions about the direction of movement in Aboriginal fertility will be re-examined later in this paper.

FIGURE 3
OWN-CHILDREN ESTIMATES OF ABORIGINAL
TOTAL FERTILITY RATES
(JAIN, 1989)
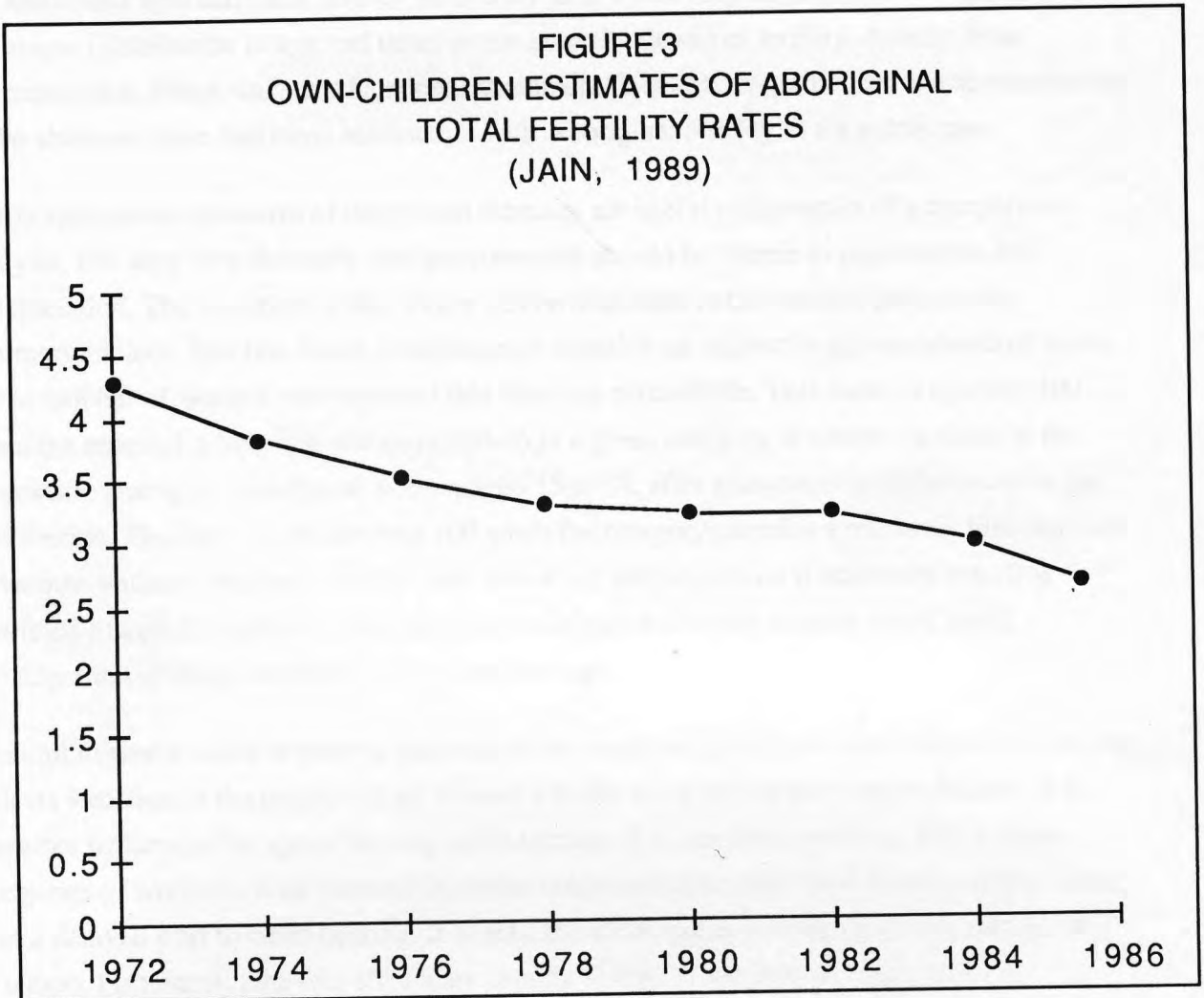
Fertility and characteristics of Aboriginal women

Previous research (Gray, 1983) has established certain characteristics of Aboriginal women that are associated with different patterns of fertility, and which may be described in terms of either the *tempo* (distribution in age and time) or the *intensity* (level) of fertility. Among these characteristics, things such as educational attainment, labour force participation and income can all be shown to have had close association with Aboriginal fertility in the recent past.

While appropriate measures of tempo and intensity are useful components of a comparative analysis, it is also very desirable that any measures should be simple in construction and interpretation. The statistical tables which will be discussed in this section include two summary indices. The first index (*childlessness index*) is an indirectly-age-standardized index of the number of women who reported that they had no children. This index is equal to 100 when the reported proportion without children in a given category of women is equal to the proportion among all Aboriginal women aged 15 to 34, after allowance for differences in age distribution. The index is greater than 100 when the category contains a relatively high number of women without children, and less than 100 when the proportion is relatively low. It is restricted to ages 15 to 34, on the grounds that inclusion of older women would entail consideration of many children born a long time ago.

The childlessness index is partly a measure of the tempo of fertility, because variation in its size reflects variation in the proportion of women who have not yet started to bear children. It is therefore influenced by age of starting child-bearing. It is possible, however, that in some categories of women a high value of the index could indicate a high level of infecundity, rather than a delayed start to child-bearing. It is also, therefore, partly a measure of intensity as well as tempo. Fortunately, the two effects are usually visible as separate components of a distribution, as will be seen in one context shortly.

The second index, the *index of maternal fertility*, is a measure of the intensity of child-bearing by women aged 15 to 34 who reported that they were mothers. It is an indirectly-age-standardized index of the average number of children ever borne by a category of mothers. A level higher than 100 indicates greater intensity of child-bearing, in comparison with average levels among Aboriginal women.

Both indices are shown in Table 2, which gives differentials in reported numbers of children according to the age at which women left school, in geographical sections of States.

Table 2. Reported children ever borne by Aboriginal
women aged 15 to 34, by age left school,
section of State, Australia, Census 1986

Section of State and age left school	No children		Mothers		
	Number	Index[a]	Number	CEB	Index[b]
MAJOR URBAN:					
Never attended	41	193	22	78	130
12 or less	21	93	48	149	118
13	28	53	152	448	111
14	195	71	646	1738	104
15	1163	96	2206	5286	94
16	1331	125	1506	3241	86
17	779	155	568	1125	78
18 or more	359	191	218	443	75
Still at school	797	130	10	26	144
Not stated	157	114	208	557	101
Sub-total	4871	119	5584	13091	92
OTHER URBAN:					
Never attended	70	124	102	299	112
12 or less	20	60	101	302	114
13	52	61	196	565	114
14	242	67	846	2480	114
15	1348	79	3445	8897	103
16	1566	90	3074	7225	97
17	822	113	1189	2651	91
18 or more	280	119	499	1190	92
Still at school	1298	129	28	87	175
Not stated	259	89	545	1513	110
Sub-total	5957	95	10025	25209	101

[a] Childlessness index: indirectly age-standardized index of number of women with no children against expected number

[b] Index of maternal fertility: indirectly age-standardized index of average number of children ever borne by mothers against expected number

Table 2 (cont.). Reported children ever borne by Aboriginal
women aged 15 to 34, by age left school,
section of State, Australia, Census 1986

Section of State and age left school	No children		Mothers		
	Number	Index[a]	Number	CEB	Index[b]
RURAL:					
Never attended	183	102	401	1212	115
12 or less	59	70	170	476	116
13	70	67	196	550	118
14	257	68	707	1876	110
15	856	77	2184	5584	104
16	784	83	1850	4647	103
17	366	102	650	1565	98
18 or more	208	116	398	931	93
Still at school	623	129	16	21	88
Not stated	300	79	789	2112	108
Sub-total	3706	88	7361	18974	105
TOTAL:					
Never attended	294	114	525	1589	115
12 or less	100	71	319	927	116
13	150	62	544	1563	114
14	694	68	2199	6094	110
15	3367	84	7835	19767	101
16	3681	98	6430	15113	96
17	1967	124	2407	5341	90
18 or more	847	141	1115	2564	89
Still at school	2718	129	54	134	146
Not stated	716	89	1542	4182	108
Sub-total	14534	100	22970	57274	100

[a] Childlessness index: indirectly age-standardized index of number of women with no children against expected number

[b] Index of maternal fertility: indirectly age-standardized index of average number of children ever borne by mothers against expected number

The childlessness index describes a U-shaped curve against age of leaving school, as illustrated in Figure 4, which shows the index of maternal fertility as well as the childlessness index. The childlessness index is lowest for women who left school at age 13. Women who left school earlier than that have a high index value and it is possible to surmise that this high value signifies higher levels of infecundity rather than delayed commencement of child-bearing. The highest values of the index are obtained for women who left school at ages 17, 18 or higher, or who were still at school. In these cases delay of the commencement of child-bearing is the plausible explanation. This example illustrates the twin interpretations of high values of the childlessness index very well, and appears to signal that they will rarely be confounded because they apply to very different categories of women.

A striking feature of the distribution of childlessness as represented in Table 2 is that all the differentials are much more marked in the case of women located in major urban areas than they are in the cases of women in other urban and rural areas of Australia. This accentuation of difference will also be observed in the cases of other descriptive variables, whenever the major urban category is contrasted with other geographical sections. A possible explanation for such an effect is that in the major urban areas the range of opportunities for pursuing different lifestyles is greatest, so that the effects of differences between categories of women can come most prominently into play.

This observation about variable opportunity to pursue different lifestyles has far-reaching implications. To the extent that demographic outcomes are associated with lifestyles that are, perceptually, matters of choice, opportunity factors may constrain choice for Aboriginal people in ways which may be unfamiliar to urban Australians accustomed to unfettered exercise of choice. Similar points have been raised before and some of their implications have been canvassed (see for example Gray, 1983: 284 *ff*.), but the measurable effects which appear in the analysis in this paper are, as far as I know, the only substantiations of the observations in a demographic context.

The index of maternal fertility shows a pattern of almost monotone decrease in the intensity of maternal fertility according to age of leaving school, as is also shown in Figure 4. As in the case of childlessness, it may be noted from the table that the decrease is most marked in the major urban areas.

FIGURE 4
INDEXES OF TEMPO AND INTENSITY OF
ABORIGINAL FERTILITY, AGES 15-34
- by age of leaving school -
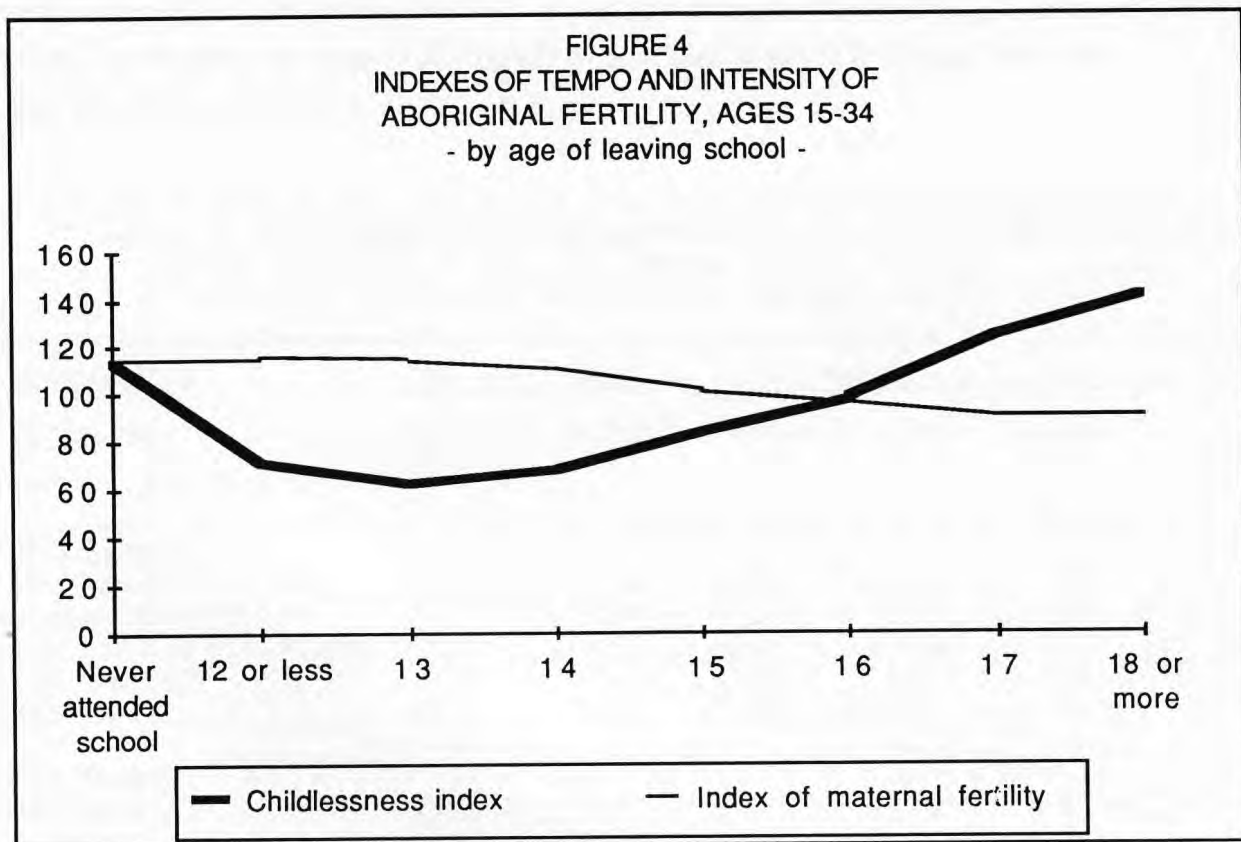
The two indices in combination determine an overall assessment of the relative level of fertility in a particular group of women. While it might not be valid to combine the indices in too simplistic a way, their joint distribution contains considerable information about how fertility is determined for a particular category of women. For example, in the case of women who have never attended school, higher than average maternal fertility is counterbalanced to some extent by higher than average childlessness, almost certainly the result of a relatively high prevalence of infecundity. In the case of women who left school at age 13, a very low relative level of childlessness combines with higher-than-average maternal fertility to promote high overall fertility. And in the case of women who left school at ages 18 or more, relative maternal fertility is low and the relative proportion of childless women is high: note that for these women *both* effects could be because of delayed commencement of child-bearing.

A simpler joint distribution of the two indices occurs for Aboriginal women classified by labour force status, shown in Table 3. Here the childlessness index is very much higher among employed women than it is among unemployed women and in turn the index is higher for unemployed women than it is for women not in the labour force. Strengthening the effect, the index of maternal fertility is lowest for employed women and highest for women who are not in the labour force. Thus, in the case of labour force status, the measures of tempo and intensity

reinforce one another in producing a strictly monotonic association between employment and relatively low fertility: the more an Aboriginal woman participates in the labour force, the smaller the number of children she is likely to have.

Table 3. Reported children ever borne by Aboriginal women aged 15 to 34, by labour force status, section of State, Australia, Census 1986

Section of State and labour force status	No children		Mothers		
	Number	Index[a]	Number	CEB	Index[b]
MAJOR URBAN:					
Employed	2255	180	1135	2315	73
Unemployed	999	137	509	1027	86
Not in labour force	1567	77	3804	9378	98
Not stated	50	76	136	371	107
Sub-total	4871	119	5584	13091	92
OTHER URBAN:					
Employed	1919	144	1823	4196	85
Unemployed	1440	116	1236	2703	94
Not in labour force	2472	70	6657	17457	107
Not stated	126	79	309	853	111
Sub-total	5957	95	10025	25209	101
RURAL					
Employed	1011	130	1349	3346	93
Unemployed	774	114	767	1868	103
Not in labour force	1761	70	4849	12696	108
Not stated	160	75	396	1064	112
Sub-total	3706	88	7361	18974	105
TOTAL:					
Employed	5185	154	4307	9857	84
Unemployed	3213	121	2512	5598	95
Not in labour force	5800	72	15310	39531	105
Not stated	336	76	841	2288	111
Total	14534	100	22970	57274	100

[a] Childlessness index: indirectly age-standardized index of number of women with no children against expected number

[b] Index of maternal fertility: indirectly age-standardized index of average number of children ever borne by mothers against expected number

The intermediate status of the unemployed category is of some interest here. There is quite clearly a distinction between women who are classified as unemployed and those women who are classified as not in the labour force, and this distinction exists in rural areas as much as it exists in urban areas. The reason for this is that the meaning of the difference between the labour force categories 'unemployed' and 'not in the labour force' is not always clear for the Aboriginal population, because many Aboriginal people live in areas where labour force participation in standard terms is not a clear option for people without jobs; yet these data illustrate that women classified as unemployed, meaning *looking for work*, have relatively low fertility. This result is consistent with a proposition that women with smaller families are freer to seek work, and is evidence that the labour force status categories do make a distinction that is evidently meaningful in describing women's participation.

As a classificatory variable, labour force status is not at all of the same order as age of leaving school. Generally, leaving school both precedes child-bearing and determines its earliest possible age of commencement - a very important matter in a population with a very high level of fertility at young ages. Labour force status, on the other hand, is a current condition which reflects happenings subsequent to the child-bearing represented by the number of children a woman has ever borne, incomplete as that child-bearing may be. It is logical to place age of leaving school in the category of determinants of fertility. While it could in some cases be an accidental effect of fertility, with age of leaving school we are dealing with an event that marks a transition from childhood and so acts as a lower bound for onset of fertility for most women. Labour force status could be either or both a cause and effect of fertility, or even no more than a mere correlated variable. Employment can be a cause of lower fertility if women delay having children or have fewer children because of their jobs. As discussed above, unemployment (as distinct from non-participation in the labour force) may also be an effect of lower fertility in the sense that women with fewer children may be freer to seek employment than women with large numbers of children.

Confusion of cause and effect can also be argued in the case of the association between the level of family income and fertility, shown in Table 4. The association is very strong between the childlessness index and family income level. Low incomes are associated with very low values of the childlessness index, and high incomes are associated with high values.

The index of maternal fertility follows, in this case, a distribution with a slight inverted U-shape. Women in the lowest category of family income may have very low levels of childlessness, but this is counterbalanced to some extent by the fact that they have a marginally below average level of maternal fertility. Women in the higher categories of family income have both high levels of childlessness and slightly lower than average levels of maternal fertility. As in previous instances, it can be seen from the tabulated data that the differentials which exist for all geographical sections are accentuated in the major urban areas. Figure 5 shows the indices of childlessness and maternal fertility classified by family income.

FIGURE 5
INDEXES OF TEMPO AND INTENSITY OF
ABORIGINAL FERTILITY, AGES 15-34
- by family income -
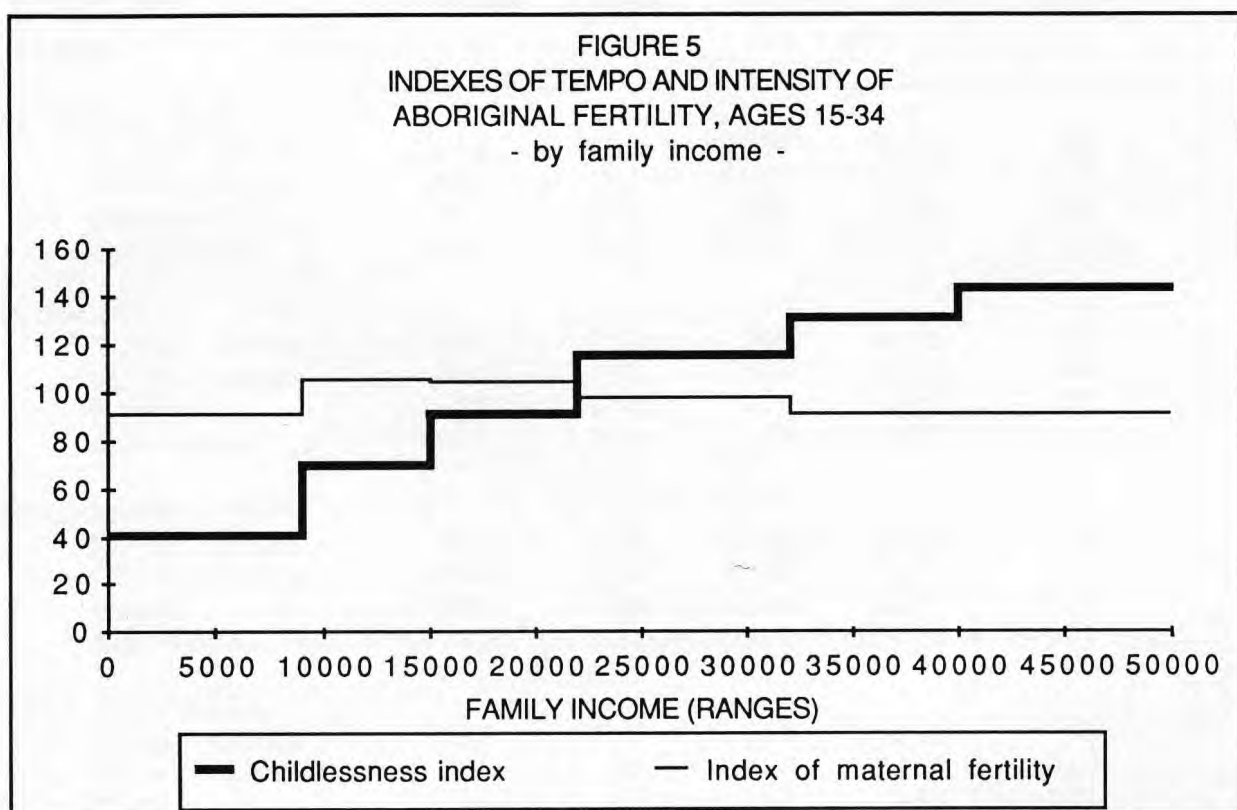
In the earlier part of this paper, differentials in total fertility rates for different geographical areas were seen to exist, but to be slighter than they were, apparently, in the past. Slight differences are also illustrated in Table 5, which shows values of the indices of childlessness and maternal fertility for sections of all the States and Territories. While there are variations, the indices do not vary nearly as much as for some of the other classificatory variables examined in this section. The most extreme cases are those of the Australian Capital Territory and Tasmania, where there are both high levels for the index of childlessness and low values for the index of maternal fertility. In the other States and the Northern Territory, these indices are mostly similar in pattern and usually in level to those for Australia as a whole. In some States, Aboriginal

Table 5 (cont.). Reported children ever borne by Aboriginal
women aged 15 to 34, by State and
section of State, Australia, Census 1986

Section of State and State	No children		Mothers		
	Number	Index[a]	Number	CEB	Index[b]
TASMANIA:					
Major urban	137	134	130	290	83
Other urban	282	117	316	706	87
Rural	129	114	184	419	85
Sub-total	548	120	630	1415	86
NORTHERN TERRITORY:					
Other urban	733	99	1177	2870	97
Rural	1198	86	2496	6478	108
Sub-total	1931	90	3673	9348	104
AUSTRALIAN CAPITAL TERRITORY:					
Major urban	115	151	90	211	88
Rural	11	114	11	30	98
Sub-total	126	147	101	241	89
TOTAL:					
Major urban	4871	119	5584	13091	92
Other urban	5957	95	10025	25209	101
Rural	3706	88	7361	18974	105
Total	14534	100	22970	57274	100

[a] Childlessness index: indirectly age-standardized index of number of women
with no children against expected number

[b] Index of maternal fertility: indirectly age-standardized index of average
number of children ever borne by mothers against expected number

Trends and prospects

The analysis in the previous section has established a number of strong associations between characteristics of Aboriginal women and their fertility. Geographic differentials, while they exist, are not nearly as strong as differentials associated with age of leaving school, labour force status and family income. Of these associated characteristics, it is age of leaving school that can be cast most plausibly in the role of a causal factor in Aboriginal fertility decline, not least because delayed age of leaving school may delay the onset of child-bearing in a population with very high rates of fertility among young women. It is of some interest to determine to what extent changes in age of leaving school could have been responsible for the observable extent of recent fertility decline.

It is therefore helpful to standardize 1981 Census data in the same way as was done in Table 2 for 1986 data classified by age of leaving school. The results are shown in Table 6, using indices which are indirectly standardized from 1986 totals so that direct comparisons may be made.

A careful comparison of the results in Table 6 and those in Table 2 will confirm that while the patterns of *association* between age of leaving school, geographical location and fertility are identical in the two sets of census data, the *levels* are generally lower for the childlessness index and higher for the index of maternal fertility in 1981. Lower childlessness and higher maternal fertility combine to establish higher levels of lifetime fertility for young Aboriginal women in 1981 than their counterparts in 1986, as would be expected given that we are dealing with a period of established fertility decline.

The population distributions in 1981 and 1986 are also different, and this has a considerable bearing on how the overall indices for 1981 are interpreted. While the overall childlessness index is only 80, it can be calculated that it would have been 97 if the population had had the same distribution by age of leaving school as in 1986.[4] Similarly, the index of maternal fertility would have been about 101, not 109.

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4 The full calculations require data for five year age groups, not given here, but most of the standardization can be done using the population distribution from Table 2 instead of that in this table.

Table 6. Reported children ever borne by Aboriginal
women aged 15 to 34, by age left school,
section of State, Australia, Census 1981

Section of State and age left school	No children		Mothers		
	Number	Index[a]	Number	CEB	Index[b]
MAJOR URBAN:					
Never attended	27	139	21	66	125
12 or less	13	81	57	166	104
13	27	62	117	366	120
14	124	66	536	1541	108
15	566	86	1297	3250	100
16	537	106	762	1650	89
17	312	147	233	487	85
18 or more	122	171	110	225	77
Still at school	285	128	11	30	113
Not stated	57	98	119	311	99
Sub-total	2070	104	3263	8092	98
OTHER URBAN:					
Never attended	27	91	81	280	124
12 or less	25	62	94	311	131
13	30	64	166	592	126
14	102	41	815	2646	121
15	640	61	2362	6542	112
16	648	74	1681	4132	103
17	329	91	649	1477	97
18 or more	100	96	230	551	98
Still at school	452	128	18	51	119
Not stated	66	62	286	881	118
Sub-total	2419	75	6382	17463	110

[a] Childlessness index: indirectly age-standardized index of number of women with no children against expected number based on *1986 Census distribution of childlessness among Aboriginal women*

[b] Index of maternal fertility: indirectly age-standardized index of average number of children ever borne <u>by mothers</u> against expected number based on *1986 Census average number of children ever borne by Aboriginal women*

Table 6 (cont.). Reported children ever borne by Aboriginal
women aged 15 to 34, by age left school,
section of State, Australia, Census 1981

Section of State and age left school	No children		Mothers		
	Number	Index[a]	Number	CEB	Index[b]
RURAL:					
Never attended	135	99	440	1479	120
12 or less	70	49	307	817	113
13	70	54	271	774	120
14	212	60	807	2426	120
15	515	60	1807	4925	114
16	485	70	1332	3328	108
17	179	77	455	1115	106
18 or more	111	89	291	710	101
Still at school	279	126	19	38	106
Not stated	86	56	377	1059	114
Sub-total	2142	71	6106	16671	113
TOTAL:					
Never attended	189	102	542	1825	121
12 or less	108	54	458	1294	116
13	127	58	554	1732	122
14	438	55	2158	6613	118
15	1721	67	5466	14717	109
16	1670	81	3775	9110	102
17	820	102	1337	3079	98
18 or more	333	111	631	1486	96
Still at school	1016	128	48	119	113
Not stated	209	66	782	2251	113
Total	6631	80	15751	42226	109

[a] Childlessness index: indirectly age-standardized index of number of women with no children against expected number based on *1986 Census distribution of childlessness among Aboriginal women*

[b] Index of maternal fertility: indirectly age-standardized index of average number of children ever borne <u>by mothers</u> against expected number based on *1986 Census average number of children ever borne by Aboriginal women*

Once the appropriate standardizations are done, it therefore seems that there was actually little difference in the lifetime fertility behaviour of the cohorts of 15-34-year-olds in 1981 and 1986. The differences that existed were due almost entirely to different levels of educational attainment. It can therefore be argued forcefully that changes in age of leaving school account for a very large amount of such fertility decline as has occurred among younger Aboriginal women in the recent past.

This observation provides a definite handhold for assessing prospects for trends in Aboriginal fertility in the current period and immediate future. On the face of things, it would seem that the rather slower rate of improvement in levels of retention of Aboriginal school students in the 1980s than in the 1970s might imply some slowing of continuing downward drift in Aboriginal fertility. On the other hand, higher levels of education achieved by more recent school-leavers might affect fertility of women in their later twenties and early thirties for some time to come yet. If the downward drift *is* education-driven, there is certainly no obvious factor that could operate to reverse it.

This assessment, that Aboriginal fertility is likely to continue its gently downward trend, can be supported using other sets of data as well. Table 7 shows age- and parity-specific fertility rates from Western Australia for the two years 1981 and 1986.[5] The two most obvious findings are that all the parity-specific birth rates for age group 15-19 were lower in 1986 than in 1981, and all the age-specific birth rates for parity 0 were lower in 1986 than in 1981. The first result indicates movement towards more fertility control both before and after first births for very young women, and the second also seems to indicate more fertility control before first births.

Because the rates shown in Table 7 represent non-renewable processes (progression from one parity to another), they can be used to construct multi-state attrition tables to calculate what the completed fertility of a cohort of women who experienced each of the rates from either year would be. When this is done, virtually the only difference between the *eventual fertility patterns* implied by the 1981 and 1986 rates turns out to be the very first parity progression, that is the probability of having a first birth. From the 1981 age-parity-specific rates, the first parity progression ratio is 0.849, but from the 1986 rates it is only 0.766 - a drop of about 10 per cent. The lifetime probabilities of progression for the next three parities are surprisingly constant: from first to second birth, 0.890 using 1981 rates and 0.888 using 1986 rates; from

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5 The births data, classified by age and parity, used to calculate these rates are from the Western Australian Health Department's midwives collection, while the denominator population data classified by age and number of children ever borne, are from the 1981 and 1986 Censuses. Note that the total fertility rates for 1981 and 1986 average to about 3.5 - quite a lot higher than the estimate of 3.0 obtained for the 1981-1986 period in Table 1: the pattern of the age-specific rates is similar, but the level higher. The most likely explanation for this result is non-comparability of levels of enumeration in numerator and denominator data in Table 7: this would indicate that while the 1981 and 1986 Censuses were reasonably comparable for Western Australia, they may both have under-estimated the Aboriginal population by between 10 and 20 per cent.

second to third birth, 0.772 using 1981 and 0.777 using 1986; and from third to fourth birth, 0.675 using 1981 and 0.689 using 1986. Beyond that, the comparisons become unstable due to small numbers of actual events.

Table 7. Birth rates specific to age group and parity, Western Australian Aboriginal women, Censuses 1981 and 1986

Age group:	Parity: 0	1	2	3	4	5+
			1981			
15 -19	0.155	0.302	0.215[a]	*	*	*
20 -24	0.149	0.351	0.338	0.376	0.152	0.461
25 -29	0.049	0.166	0.171	0.150	0.230	0.215
30 -34	0.036	0.086	0.082	0.052	0.124	0.101
35 -39		0.017		0.028	0.034	0.048
40 -44					0.026	0.030
45 -49						
			1986			
15 -19	0.134	0.276	0.175[a]	*	*	*
20 -24	0.114	0.325	0.287	0.232	0.302	0.055
25 -29	0.037	0.125	0.136	0.184	0.232	0.234
30 -34	0.013	0.079	0.099	0.066	0.074	0.142
35 -39		0.045	0.023	0.038	0.006	0.036
40 -44			0.011	0.022		0.005
45 -49						0.003

Sources: Rates were calculated using numerator data from the Western Australian Health Department's midwives collection and denominator data from the 1981 and 1986 Censuses of Population by the Australian Bureau of Statistics
[a] Birth rate for parities 2+

What these data suggest, therefore, is a sequence of changes to the tempo of Aboriginal fertility in Western Australia which do not affect intensity past the first birth. And in the case of the first birth, it is more than likely that the apparent drop in intensity is in large part a tempo effect caused by simultaneous delay of first births by different cohorts of women. This delay effect can probably be attributed to larger numbers of young women participating in education during the last few teenage years.

It may seem surprising, in view of the identifiable constancies that they contain, that the same attrition tables are not at all inconsistent with continuing downward movement in the Aboriginal total fertility rate in Western Australia. This is because past higher fertility has tended to place more women in categories with relatively high risk of giving birth than in categories with relatively low risk. Thus if the multi-state attrition tables are used to construct corresponding total fertility rates allowing for necessary parity progressions as well as standardizing for age, the result for 1981 is 3.25, somewhat lower than the (standard-basis) total fertility rate for that year, and for 1986 the result is 2.79, again lower. Thus a natural progression through the age-parity-specific rates would result in lower Aboriginal fertility in Western Australia than has been achieved so far.

There seem to be very powerful reasons for accepting the prospect of continuing downward drift in levels of Aboriginal fertility, but there is little support in this analysis for the existence of a recent sharp downward turn as suggested by Jain's own-children analysis. The misleading nature of trends observed in estimates based on the own-children method should provide powerful incentive to rapid development of other sources of estimates of Aboriginal fertility rates in order to monitor developments.

APPENDIX A. ESTIMATION METHODS

Census data on children ever borne have classification problems which are shared in data from many countries. Recognized deficiencies include a systematically higher level of non-response from women who are not mothers (EL-Badry, 1961) and systematic under-reporting by older women, for a large number of possible reasons which have been identified.

In an appendix to a previous paper on Aboriginal child survival (Gray, 1988: 28-33), some classification recovery methods for some types of systematic response errors were described. For instance, it was shown that in the Aboriginal data there existed a strong linear relationship, and very sound theoretical reasons for a strong linear relationship, of the form

$$NS_i/Z_i = [a/((1-a)(1-x))].D_i/Z_i + z/(1-z)$$

where NS_i is the proportion of non-respondents in age group i, Z_i is the reported proportion of women without children, D_i is the proportion of women who reported that children had died, a is a non-age-specific incidence of non-response to the question on children ever borne from women who have lost children, x is a similar non-age-specific incidence of non-response to the question on children still living from women who have lost children, and z is a non-age-specific incidence of non-response by women who are not mothers.

Not all the parameters of this equation can be estimated, but one which can is the parameter z, which El-Badry (*loc. cit.*) termed zero error and estimated by less satisfactory means. Estimating the size of z is critical to obtaining reasonable estimates of age-specific birth rates for age group 15-19 and to a much smaller extent slightly older age groups. This is because ignoring the existence of systematically greater non-response from women who are not mothers will result in estimates of average numbers of children ever borne that are too high. As a consequence, estimates of age-specific birth rates will also be too high, mainly for the 15-19 age group. The following estimates of the zero error parameter (the proportion of women who have no children but do not answer the census question on children ever borne) were obtained from 1986 data:

Major urban	0.21
Other urban	0.29
Rural	0.40

This method of estimating z, while theoretically sound, could not be employed for 1981 Census data because values of D_i were not published. As it happens, the quantity D_i/Z_i is approximated reasonably well by a linear function of age (i). If this is done, the following values of z are obtained for 1986 and 1981:

	1986	1981
Major urban	0.22	0.33
Other urban	0.28	0.48
Rural	0.40	0.53

The estimates for 1986 are almost identical with those obtained previously, so it seems reasonable to use the corresponding estimates for 1981. But it is not at all clear why it should be found that the incidence of non-response by Aboriginal women who were not mothers should be so different in the two censuses. It is true only that the differences appear to be systematic, they have very similar estimated sizes in the different States and Territories, and they also produce estimates of proportions childless that are mainly very consistent in age cohort comparisons of the two sets of census data.[6] Table A1 shows estimates for the States and Territories.

Note that in rural areas of three States, reasonable estimates of z could not be obtained from the 1981 data. In these cases, the theoretically strong linear relationships were not strongly linear in practice, and resultant estimates of proportions childless were not reasonable. Here 'reasonable' means resulting in plausible sequences of proportions childless for age cohorts in 1981 and 1986. In the three unsatisfactory cases, the overall estimate for rural areas (0.53) was found to be reasonable in this sense.

After making corrections for the incidence of non-response by women who were not mothers, the average numbers of children ever borne by age cohorts of Aboriginal women in 1981 and 1986 were compared. Some of these comparisons, for sections of States, are illustrated in Figures A1 to A3.

The graphs are aligned in age cohorts, and in logical terms it should be found that the 1986 line lies above the 1981 line, with the gap between the two lines representing intercensal fertility. The gap should theoretically close to zero in the highest age groups, but in fact there are slight overlaps between the two lines on each graph at ages above about 40. These overlaps are actually the result of *mothers* in 1986 reporting fewer children than they had reported in 1981. It seems possible that the anomaly is due to under-reporting of children who may have left home between 1981 and 1986.

It is also likely that such under-reporting extends into somewhat younger age groups, without resulting in a negative gap. However it is caused, the anomaly must be adjusted so that the gap closes where it should, at around age 50. If it is ignored, the anomaly causes serious problems

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6 The possibility that the systematic improvement was due to census processing procedures should not be overlooked. As noted in the child survival paper (Gray, 1988), data on children ever borne and children still living were used to cross-edit each other in 1986 processing. In 1981, the data on children still living was not used as an output variable.

in estimating intercensal fertility rates. The best apparent way to perform an adjustment with minimal artificial inflation of the gap between the two lines was to adjust the entire 1981 series for each section of State slightly downward by the maximum multiplicative difference between the two series (specific to that section of State) in age groups 40-44, 45-49 and 50-54. This made only a very small change to the size of the gap below age group 35-39 and gave minimal positive differences in the final age groups.

The age cohort differences were finally transformed into age-specific birth rates as shown in Table 1, using the method of parity increments (United Nations, 1983: 58-64). As data for sections of States within States might not be reliable in all cases they have not been included in Table 1. The estimates for older age groups should be regarded as much less reliable than those for younger age groups, because of the method of adjustment which has just been described.

Table A1. Estimated incidence of zero error[a],
States and Territories by sections,
Censuses 1981 and 1986, Aboriginal women

State/Territory	Major urban	Other urban	Rural
NSW & ACT - 1986	0.22	0.29	0.31
- 1981	0.32	0.48	0.52
VIC & TAS - 1986	0.19	0.21	0.23
- 1981	0.34	0.48	*
QLD - 1986	0.22	0.30	0.44
- 1981	0.34	0.51	0.68
SA - 1986	0.22	0.20	0.45
- 1981	0.33	0.46	*
WA - 1986	0.26	0.33	0.38
- 1981	0.37	0.48	0.49
NT - 1986		0.29	0.43
- 1981		0.47	*
Total - 1986 (1)	0.21	0.29	0.40
- 1986 (2)	0.22	0.28	0.40
- 1981	0.33	0.48	0.53

[a] Incidence of non-response to question on children ever born to women who are not mothers
(1) Based on more exact method - see text
(2) Based on approximate method (used for all 1981 estimates) - see text
* Poor linear relationship - no reasonable estimate

FIGURE A1
CHILDREN EVER BORNE BY AGE COHORTS, 1981 & 1986
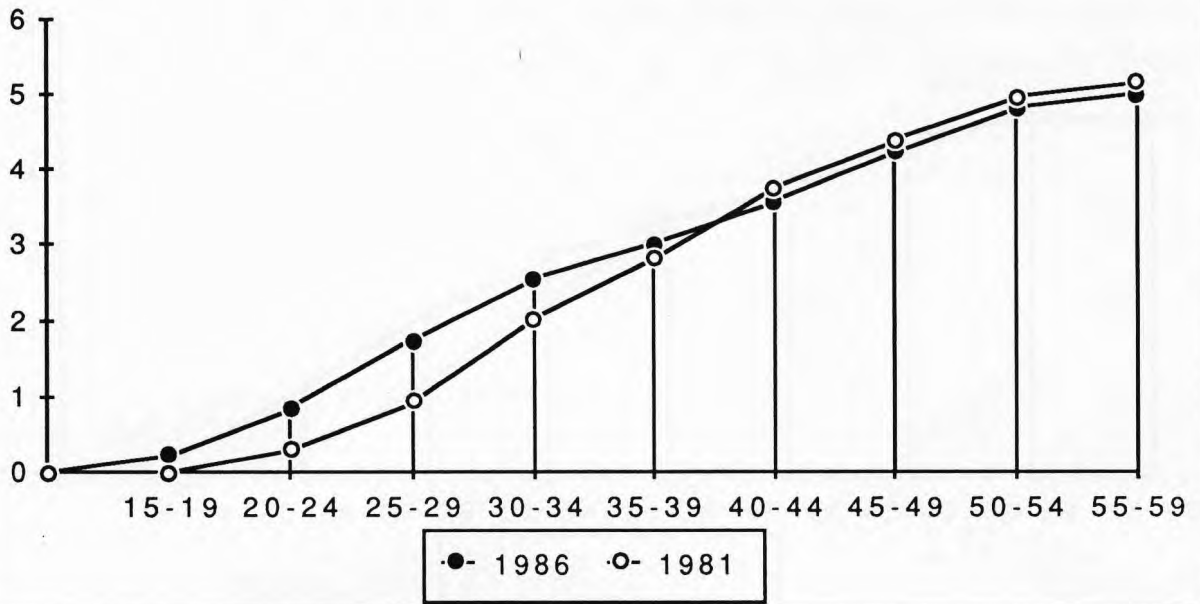CLASSIFIED BY AGE IN 1986
- Major Urban -

FIGURE A2
CHILDREN EVER BORNE BY AGE COHORTS, 1981 & 1986
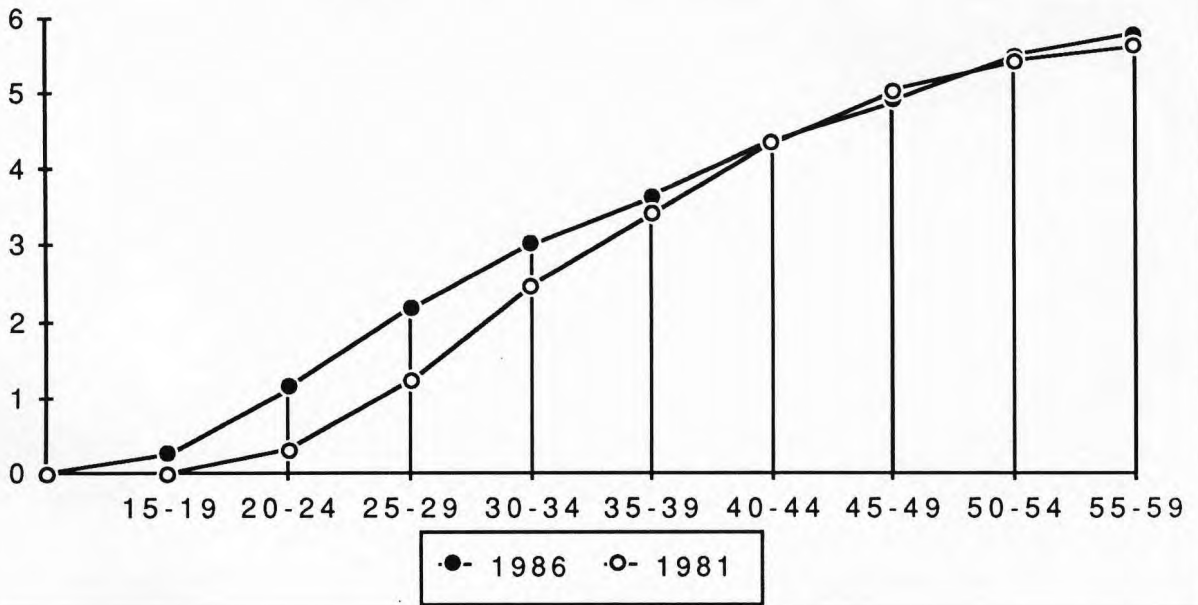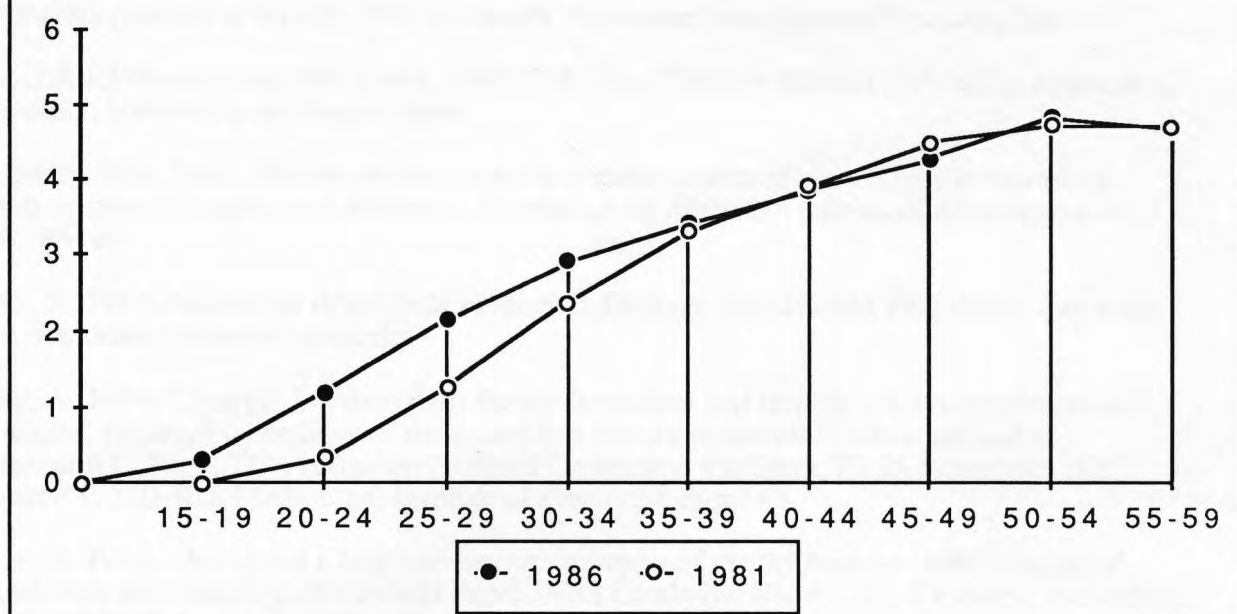CLASSIFIED BY AGE IN 1986
- Other Urban -

FIGURE A3
CHILDREN EVER BORNE BY AGE COHORTS, 1981 & 1986
CLASSIFIED BY AGE IN 1986
- Rural -

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